

Kindergarten Readiness, Preschool Attendance, and Academic Achievement



Comprehensive and Longitudinal Outcomes Cincinnati Public Schools



Report Sponsored by Success By 6®
Prepared in Partnership with Cincinnati Public Schools and
INNOVATIONS in Community Research and Program Evaluation at Cincinnati Children's Hospital Medical Center
Contact: Innovations@cchmc.org

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Kindergarten Readiness, Preschool Attendance, and Academic Achievement: Comprehensive and Longitudinal Outcomes

EXECUTIVE SUMMARY

This evaluation examines the relationship between kindergarten readiness and academic achievement through high school graduation. The relationship between preschool attendance, kindergarten readiness and academic outcomes was also assessed for a subset of students who attended preschool prior to kindergarten. This evaluation is timely given emerging literature on the importance of preschool, early literacy, and school readiness, and their links to long-term student achievement and success.

For students attending Cincinnati Public Schools (CPS), kindergarten readiness was assessed using the Kindergarten Readiness Assessment-Literacy or the (KRA-L), which measures literacy skills and academic readiness. The KRA-L was administered to kindergarten students in the State of Ohio between August through October during the academic years of 2004-05, 2005-06, and 2006-07. For this evaluation, and consistent with the scoring guidelines for the KRA-L, students who scored 19-29 points (out of 29 possible points) were considered “on-track” for kindergarten readiness and literacy. The KRA-L is also scored according to achievement bands: Band 3 (Assess for enriched instruction; 24-29 points); Band 2 (Assess for targeted instruction; 14-23 points); and Band 1 (Assess broadly for intense instruction; 0-13 points). Data were analyzed by *INNOVATIONS* in Community Research and Program Evaluation of Cincinnati Children’s Hospital Medical Center using de-identified records, in partnership with CPS and the United Way of Greater Cincinnati Success By 6[®]. The current report focuses on the long-term impact of kindergarten readiness with the aims of the evaluation as follows:

1. **Kindergarten Readiness Through 12th Grade Outcomes**
 - a. To evaluate academic outcomes related to kindergarten readiness. Academic outcome variables include 3rd grade literacy/math, 8th grade literacy/math and 12th grade credits, ACT and high school graduation.
 - b. Assess whether there are differences in kindergarten readiness or academic outcomes related to race and socio-economic status (SES) variables (using free and reduced lunch status as a proxy for SES).
2. **Preschool Attendance, Kindergarten Readiness and Academic Outcomes**
 - a. To evaluate academic outcomes related to preschool enrollment in a subset of children who attended preschool prior to kindergarten. Short-term academic outcome variables include kindergarten readiness and 3rd grade literacy/math.
 - b. Assess whether there are any differences on academic outcomes related to race and socio-economic status (SES) variables (using free and reduced lunch status as a proxy for SES).

A. Kindergarten Readiness: Kindergarten through 12th Grade Outcomes

Kindergarten readiness was predictive of academic outcomes throughout a student’s high school experience. Students who were “on-track” on the KRA-L were **314% more likely** to score proficient on the 3rd grade Math OAT compared to students who were not “on-track”. Students who were “on-track” on the KRA-L were **370% more likely** to score proficient on the 3rd grade Reading OAT compared to students who were not “on-track”. Students who were “on-track” on

the KRA-L were **228% more likely** to score proficient on the 8th grade Math OAT compared to students who were not “on-track”. Students who were “on-track” on the KRA-L were **276% more likely** to score proficient on the 8th grade Reading OAT compared to students who were not “on-track”. Students who were “on-track” for kindergarten readiness scored on average **5.08 points higher** on the ACT for 11th graders and **4.3 points higher** for 12th graders compared to students who were not on-track. Students who were on “on-track” for kindergarten readiness completed, on average, **1.6 more credits** by the end of 12th grade than those who were not ready. Students who were ready for kindergarten were **118% more likely** to graduate on time compared to students who were not ready. All these relationships are even stronger when comparing students who scored in Band 3 to students who scored in Bands 1 and 2.

Figure 2. 3rd Grade Reading Proficiency by KRA-L On-Track Status

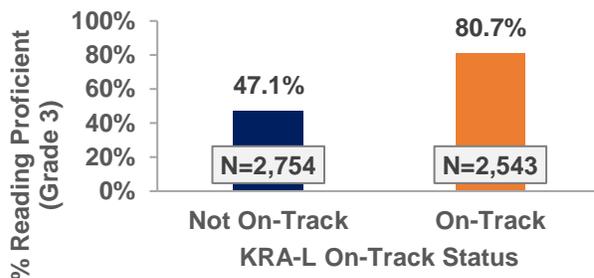
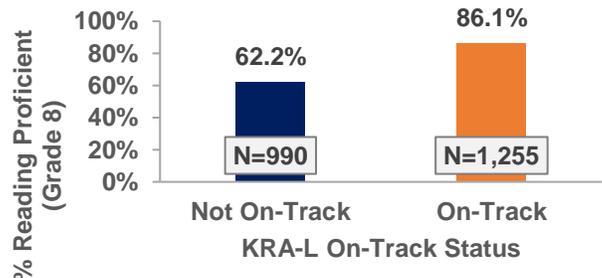


Figure 10. 8th Grade Reading Proficiency by KRA-L On-Track Status



Key Findings - Kindergarten Readiness: Kindergarten Through 12th Grade Outcomes:

1. **Kindergarten Readiness Impacts 3rd and 8th Grade Achievement:** Students who were on-track for kindergarten readiness/literacy (score of 19 or higher) and those who were in Band 3 (score of 24 or higher) performed significantly better on 3rd and 8th grade reading and math. For students who were on-track in kindergarten, 33.6% more students were proficient in reading compared to students who were not on-track in kindergarten (23.9% difference for 8th grade reading proficiency). For students who were on-track in kindergarten, 31% more students were proficient in math compared to students who were not on-track in kindergarten (27% difference for 8th grade math proficiency).
2. **Kindergarten Readiness is Related to Long-Term Achievement:** There were long-term achievement outcomes such as higher ACT scores, more credits earned, and greater likelihood of high school graduation associated with being on-track for kindergarten readiness (score of 19 or higher) compared to not being on-track for kindergarten readiness (Score of 18 or lower). Increased graduation, employment and college enrollment also results in community and economic benefits for students and society.
3. **For Low Income Students, Kindergarten Readiness Matters Most:** Kindergarten readiness reduced academic risks, especially for low income students. Of students who were on-track for kindergarten, 30% more students who were reading proficient compared to students who were not on-track for kindergarten (23.9% difference for 8th grade reading proficiency). Similar trends were noted for math proficiency.
4. **Pursue Opportunities to Address Gaps in Readiness and Achievement:** Note that many students entered school ready to learn and succeed, while other students needed supports to

adapt, learn and/or achieve. While some students were not on-track in kindergarten, they were all valued, and many of them made gains, succeeded, and graduated.

- 5. Ensure Support and Success of All Students:** Future efforts will need to examine best practices to ensure the support, achievement, and success of all students regardless of income, race, or background. This will include ensuring that students who may not be prepared for kindergarten will graduate ready to succeed in life.

B. Preschool Attendance: Kindergarten Readiness and Academic Outcomes

A subset of the students in the kindergarten readiness cohorts (for the 2004-05, 2005-06 and 2006-07 academic years attended CPS preschool (22.3%). This evaluation does not account for students who may have attended non-CPS preschools. CPS preschool attendance was predictive of kindergarten readiness. Students who attended preschool were **53% more likely** to score “on-track” on the KRA-L compared to students who did not attend preschool. Students with two years of CPS preschool (58.5%) performed better on the KRA-L than those with 1 year (52.2%) and those with no CPS preschool (44.1%). Students with 2 years of preschool attendance were **79% more likely** to score “on-track” on the KRA-L compared to students who did not attend. Students with 2 years of preschool attendance were **29% more likely** to score “on-track” on the KRA-L compared to students with only 1 year of preschool attendance. Black and low-income children especially benefited from preschool attendance. African-American/Black children who attended preschool were **66% more likely** to score “on-track” on the KRA-L compared to black children who did not attend. Low income children who attended preschool were **74% more likely** to score “on-track” on the KRA-L compared to low income children who did not attend. Preschool attendance is critically important as students who attended preschool regularly (90% or more days) were **149% more likely** to be ready for kindergarten compared to children who were chronically absent. Also, students who attended preschool on a regular basis were **58% more likely** to score proficient on the 3rd grade Reading OAT compared to students who were chronically absent. Note that no effects for preschool were found beyond 3rd grade. Because CPS preschools were meeting the highest quality standards set forth by the Ohio Department of Education (ODE) at that time.

Figure 30. Percent On-Track by CPS Preschool Dosage

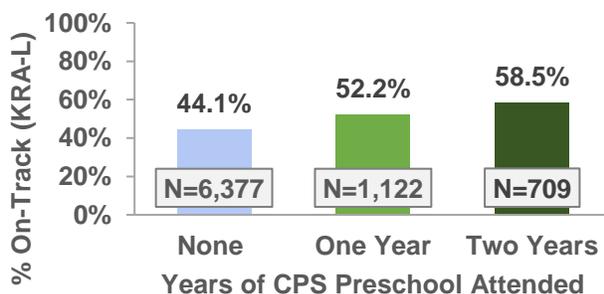
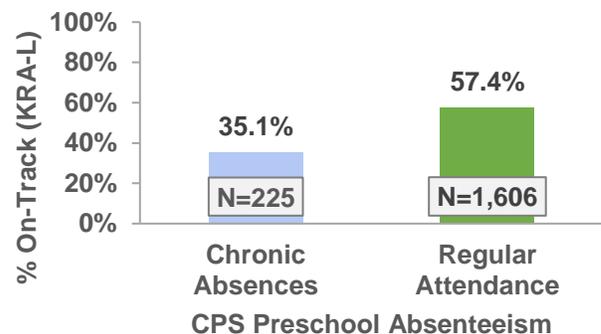


Figure 31. Percent On-Track by CPS Preschool Attendance



Key Findings - Preschool Attendance: Kindergarten Readiness and Academic Outcomes

- 1. Preschool Attendance Supports Kindergarten Readiness:** Preschool attendance significantly increases children's kindergarten readiness on the KRA-L. Children who attended preschool were 53% more likely to be measured as on-track for kindergarten on the KRA-L (54.8% on-track) compared to those who did not attend preschool (44.2% on-track).
- 2. Daily Attendance is Important to Learning and Kindergarten Readiness:** Preschool attendance is critical to improving kindergarten readiness. Children who attend more days (>90% of days) during a school year were significantly more ready for kindergarten (KRA-L). Those with regular attendance were 149% more likely to be on-track for kindergarten (57.4% ready) compared to 35.1% ready for those with chronic absenteeism (<90% attendance).
- 3. More Years of Preschool Benefits Children:** Children with more years of preschool are more ready for kindergarten (KRA-L). Only 44.1% of children were on-track for readiness in kindergarten with no preschool, whereas 58.5% of children with two (2) years of preschool were on-track for kindergarten, and 52.2% of children with one (1) year of preschool were on-track for kindergarten.
- 4. Low Income and African/Black Students Especially Benefit from Preschool:** Low income students who attended preschool were 74% more likely to score on-track on the KRA-L compared to their peers who did not attend preschool. African-American students who attended preschool were 66% more likely to score on-track on the KRA-L compared to their peers who did not attend preschool.
- 5. Preschool Benefits Children Through 3rd Grade:** The benefits of preschool were sustained through 3rd grade, with children who attended two years of preschool showing higher 3rd grade reading achievement scores compared to children who did not attend preschool. Children who attended preschool regularly (>90% attendance) showed higher 3rd grade reading scores compared to those who did not attend regularly (<90% attendance).
- 6. Expand Knowledge and Understanding Through Evaluation and Research:** Due to attrition, the small sample of preschool children, and other limitations, analyses could not be run reliably to test effects beyond 3rd grade. Future evaluation and research that include additional student, family, and academic variables will provide an enhanced understanding of the link between preschool attendance, kindergarten readiness and long-term academic success.

Overall Learnings and Opportunities:

- Enrollment and Regular Attendance in a High Quality Preschool Matters*
 - An important step to ensuring that children are ready for kindergarten is to enroll them in a high quality preschool.
 - Low income children especially benefit from preschool as they are more likely to show the benefits of preschool compared to their peers who did not go to preschool especially through 3rd grade.

- Children who attend 2 years of preschool (vs one year or not at all) are more likely to be ready for kindergarten.
 - Children who attend preschool regularly have increased kindergarten readiness compared to those who are chronically absent.
2. *Readiness for Kindergarten is Fundamental for Academic Success*
- Students who attended preschool were more ready for kindergarten.
 - Kindergarten readiness is linked to a number of academic outcomes including better performance on 3rd and 8th grade State Math and Reading tests, higher ACT scores, more high school credits earned, and four-year graduation.
 - Low income and African-American/Black students especially benefit from being ready for kindergarten.
 - Individualized assessment and instruction may be key to ensuring that students' needs are identified early and that students make progress academically and socially.
3. *Supporting Every Student is Important to Closing Performance Gaps*
- Performance gaps exist for some students. Educational support and opportunities can provide enrichment opportunities and resources for students and families when needed.
 - Providing students with learning supports in the classroom and during out-of-school time have been shown to benefit children.
 - Teachers and parents play an important role in identifying areas of strengths and opportunities for students and providing them with consistent encouragement.
 - Data-driven strategies are important to implementing best practices and applying these approaches to real world classroom settings.
 - Planning among teachers, staff and leadership can ensure that supporting every student from preschool through high school graduation continues to be a priority.

Kindergarten Readiness, Preschool Attendance, and Academic Outcomes: Comprehensive and Longitudinal Outcomes

Introduction

This evaluation examines the relationship between kindergarten readiness and academic achievement. The relationship between preschool attendance, kindergarten readiness and academic outcomes was also assessed for a subset of students who attended preschool. This evaluation is timely given emerging literature on the importance of preschool, early literacy, and school readiness and their links to long-term student achievement and success. A study exploring the impact of preschool attendance on school readiness found that students enrolled in a universal preschool program were more ready for school compared to children who were not enrolled in the program. The positive effects were greater for black and low-income students (Gormey, Phillips, & Gayer, 2008). And, a study examining the relationship between kindergarten readiness and fourth grade achievement found that students who were ready for kindergarten also performed better on fourth grade reading and math state achievement tests compared to student who were not ready for kindergarten (Kurdek & Sinclair, 2001).

Kindergarten readiness in this evaluation was assessed using the Kindergarten Readiness Assessment-Literacy or the (KRA-L), which measures literacy skills and academic readiness. The KRA-L was administered to kindergarten students in the State of Ohio, including students within the Cincinnati Public Schools (CPS) district between August through October during the academic years of 2004-05, 2005-06, and 2006-07. The KRA-L was administered by trained professionals through individual, individual or small group, and individual, small or large group formats in accordance with state guidelines.

Evaluation Goals:

The longitudinal evaluation of academic achievement provides a unique opportunity to understand the relationship among demographic characteristics, preschool attendance, kindergarten readiness status, and later academic achievement. The goals of the evaluation were as follows:

1. **Kindergarten Readiness Through 12th Grade Outcomes**
 - a. To evaluate academic outcomes related to kindergarten readiness. Academic outcome variables include 3rd grade literacy/math, 8th grade literacy/math and 12th grade credits, ACT and high school graduation.
 - b. Assess whether there are differences in kindergarten readiness or academic outcomes related to race and socio-economic status (SES) variables (using free and reduced lunch status as a proxy for SES).
2. **Preschool Attendance, Kindergarten Readiness and Academic Outcomes**
 - a. To evaluate academic outcomes related to preschool enrollment in a subset of children who attended preschool prior to kindergarten. Short-term academic outcome variables include kindergarten readiness and 3rd grade literacy/math.
 - b. Assess whether there are any differences on academic outcomes related to race and socio-economic status (SES) variables (using free and reduced lunch status as a proxy for SES).

Part A. Kindergarten Readiness: Kindergarten Through 12th Grade Outcomes

Methods

Sample

De-identified data including kindergarten readiness and academic achievement variables were provided for analysis. The sample was comprised of students who attended CPS kindergarten in the 2004-2005, 2005-2006, and 2006-2007 academic years. These cohorts were combined to increase the sample size and power for analyses. The original combined cohort was comprised of 8,208 students (records), which decreased to 5,501 students (records) by 3rd grade as a result of attrition. The most common reason for attrition is student mobility out of the district. The final sample at graduation was 2,158 students, which may be the result of mobility and students not remaining on-track for graduation after 4 years of high school. Demographic variables included gender, ethnicity, and low-income status (72.4% of students were low income (free/reduced lunch), indicating that nearly three-fourths of students' families were at 200% of poverty or below). Students from the initial KRA-L cohort were 64.8% Black and 50.6% male. The demographics (income, mobility, etc.) presented in this evaluation are similar to other published national studies on city preschool and school evaluation initiatives (Kenne et al., 2018; Fischbein et al., 2016; Kurdek & Sinclair, 2001). Demographic profiles at each milestone are presented in Table 1.

Demographic	Grade Level						
	KG	3	8	9	10	11	12
No CPS Preschool	77.7%	76.8%	74.9%	74.8%	74.2%	73.3%	73.4%
CPS Preschool	22.3%	23.2%	25.1%	25.2%	25.8%	26.7%	26.6%
Male	50.6%	50.4%	48.4%	48.2%	46.8%	46.0%	44.3%
Female	48.9%	49.4%	51.2%	51.3%	52.9%	53.7%	55.4%
Unknown Gender	0.5%	0.3%	0.3%	0.5%	0.3%	0.2%	0.3%
Black/African American	64.8%	68.1%	68.2%	70.0%	69.8%	69.6%	70.2%
White	24.0%	22.5%	21.9%	20.3%	21.1%	21.0%	20.3%
Multi-Racial	5.4%	5.2%	5.3%	5.2%	5.3%	5.3%	5.2%
Hispanic	2.4%	2.3%	2.3%	1.9%	1.8%	1.8%	1.7%
Other	1.3%	1.0%	1.1%	1.1%	1.2%	1.3%	1.4%
Unknown Race	2.2%	1.0%	1.1%	1.5%	0.8%	0.9%	1.2%
Low Income	72.4%	72.9%	69.9%	71.1%	67.8%	66.4%	65.8%
Other Income	26.2%	26.0%	29.1%	27.8%	31.2%	32.6%	33.4%
Unknown Income	1.4%	1.1%	1.0%	1.1%	1.0%	0.9%	0.7%
Not On-Track in Literacy	53.6%	53.2%	46.8%	48.8%	46.3%	45.2%	43.3%
On-Track in Literacy	46.4%	46.8%	53.2%	51.2%	53.7%	54.8%	56.7%
Sample Size	8208	5501	3293	4083	3141	2876	2158

Measures

Kindergarten Readiness

During Academic Years 2004-05, 2005-06, and 2006-07, CPS administered the Kindergarten Readiness Assessment – Literacy (KRA-L) Test, the state screener for assessing literacy skills and academic readiness in kindergarten children. The KRA-L is a 25-item assessment on which children can achieve a maximum of 29 points. The KRA-L domains are as follows: Answering Questions - Number Correct (Items 1-3), Sentence Repetition - Number Correct (Items 4-7), Rhyming and Identification - Number Correct (Items 8-14), Rhyming Production - Number Correct (Items 15-19), Letter Identification - Number Correct (Items 20-21), and Initial Sounds - Percent Correct (Items 22-25).

Kindergarten readiness was assessed using the Kindergarten Readiness Assessment-Literacy or the (KRA-L), which measures literacy skills and academic readiness. The KRA-L was administered to kindergarten students in the State of Ohio, including students within the Cincinnati Public Schools (CPS) district between August through October during the academic years of 2004-05, 2005-06, and 2006-07. For this evaluation, and consistent with the scoring guidelines for the KRA-L, students who scored 19-29 points (out of 29 possible points) were considered “on-track” for kindergarten readiness and literacy. The KRA-L is also scored according to achievement bands: Band 3 (Assess for enriched instruction; 24-29 points); Band 2 (Assess for targeted instruction; 14-23 points); and Band 1 (Assess broadly for intense instruction; 0-13 points). Data were analyzed by *INNOVATIONS* in Community Research and Program Evaluation of Cincinnati Children’s Hospital Medical Center using de-identified records, in partnership with CPS and the United Way of Greater Cincinnati Success By 6®.

Income

Free/Reduced lunch status was used as a proxy for income. Students who were eligible for free/reduced lunch are included in the “low income” group and students who paid for their lunch were included in the “other income” group.

Third Grade Reading and Math Achievement

Cincinnati Public Schools (CPS) administered the Ohio Achievement Test (OAT) to assess children enrolled in 3rd grade from 2004-05 to 2012-13. Students were given Ohio proficiency-based assessments in reading and mathematics. Each assessment involved both multiple-choice and open-ended items. Five designations have been adopted for each child's performance by the state of Ohio for the Grade 3 Math and Reading Achievement Tests. The levels for scaled scores are (a) Advanced 432 and above, (b) Accelerated 415-431, (c) Proficient 400-414, (d) Basic 385-399, and (e) Limited 0-384 (Ohio Department of Education, 2005). For this evaluation, students whose scaled scores placed them in the proficient, accelerated, or advanced categories are considered “proficient” and those students whose scaled scores placed them in basic or limited categories are considered “not proficient.” If a student had multiple test scores, the highest score was selected for analysis.

Eighth Grade Reading and Math Achievement

Cincinnati Public Schools (CPS) administered the Ohio Achievement Test (OAT) to assess children enrolled in 3rd grade from 2004-05 to 2012-13. Students were given Ohio proficiency-based assessments in reading and mathematics. Each assessment involved both multiple-choice and open-ended items. Five designations have been adopted for each child's performance by the state of Ohio for the Grade 3 Math and Reading Achievement Tests. The levels for scaled scores are (a) Advanced 432 and above, (b) Accelerated 415-431, (c) Proficient 400-414, (d) Basic 385-399, and (e) Limited 0-384 (Ohio Department of Education, 2005). For this evaluation, students whose

scaled scores placed them in the proficient, accelerated, or advanced categories are considered “proficient” and those students whose scaled scores placed them in basic or limited categories are considered “not proficient.” If a student had multiple test scores, the highest score was selected for analysis.

ACT Scores

Students took The ACT Test for Students (ACT) in the 11th and 12th grades, as a high school benchmark test to assess student progress toward graduation and college readiness. The composite score was used for analysis. If a student had multiple test scores within an academic year, the highest score was selected for analysis.

High School Credits Earned

Students earned high school credit by completing classes with a passing grade. If multiple records of high school credits were obtained for the same year for an individual student, the highest number of credits was selected for analysis.

Graduation Status

Students were considered graduates of their cohort if they completed requisite graduation requirements within four years of their entrance into 9th grade. Graduated status is achieved if the student graduated in four years or less based on students’ original entry point into 9th grade. If the year of 9th grade attendance could not be verified, then they were excluded from graduation variable. Also, graduation data is only available for students within the 2004-05 and 2005-06 cohorts; graduation data for the 2006-07 cohort is pending.

Data Analyses

The data for this project came from the 2004-2005, 2005-2006, and 2006-2007 graduating classes of students who took the Kindergarten Readiness Assessment-Literacy (KRA-L). These groups were combined to allow for a more comprehensive analysis and for more power in the analyses. Descriptive and inferential analyses were performed. Data were analyzed using logistic regression producing odds ratios and 95% confidence intervals or *t*-tests. All Odds Ratios have been converted to risk ratios for ease and accuracy of interpretation. All reported outcomes are statistically significant at an alpha level greater than 0.05. Outcomes are presented comparing students who were “on-track” (19-29 points) to students who were “not on-track” (0-18 points) as well as comparing students scoring in Band 3 (Assess for enriched instruction; 24-29 points) to students scoring in Band 1 (Assess broadly for intense instruction; 0-13 points) and Band 2 (Assess for targeted instruction; 14-23 points).

Kindergarten Readiness and 3rd Grade Achievement

Kindergarten Readiness Assessment – Literacy (KRA-L) scores were a predictor of 3rd grade reading proficiency on the Ohio Achievement Test (OAT). Students who were on-track on the KRA-L scored proficient or higher on their Reading OAT at a frequency of 80.8% versus 47.1% of those who were not on-track. As KRA-L was administered to students at the beginning of kindergarten, this finding indicates that children with higher school readiness were more likely to be proficient in 3rd grade reading.

Kindergarten readiness was a significant predictor of 3rd grade Math and Reading performance. Students who were “on-track” on the KRA-L were **314% more likely** to score proficient on the 3rd grade Math OAT compared to students who were not “on-track”. Students who were “on-track” on the KRA-L were **370% more likely** to score proficient on the 3rd grade Reading OAT compared to students who were not “on-track”. So that nearly 80% of students who were ready for kindergarten were proficient on the 3rd grade Math OAT (Figure 1) and over 80% of student who were ready for kindergarten were proficient on the 3rd grade Reading OAT (Figure 2).

These relationships were stronger when comparing 3rd grade reading proficiency and 3rd grade math proficiency for children who placed in KRA-L Band 3 compared to students who placed in Bands 1 and 2. Students whose KRA-L score placed them in Band 3 were **480% more likely** to score proficient on the 3rd grade Math OAT compared to students whose score placed them in Bands 1 or 2. Students whose KRA-L score placed them in Band 3 were **461% more likely** to score proficient on the 3rd grade Reading OAT compared to students whose score placed them in Bands 1 or 2. So that over 87% of students in Band 3 for were proficient on the 3rd grade Math OAT (Figure 3) and over 87% of students in Band 3 were proficient on the 3rd grade Reading OAT (Figure 4).

Figure 1. 3rd Grade Math Proficiency by KRA-L on-Track Status

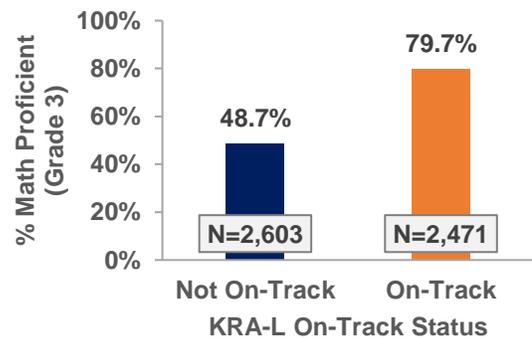


Figure 2. 3rd Grade Reading Proficiency by KRA-L On-Track Status

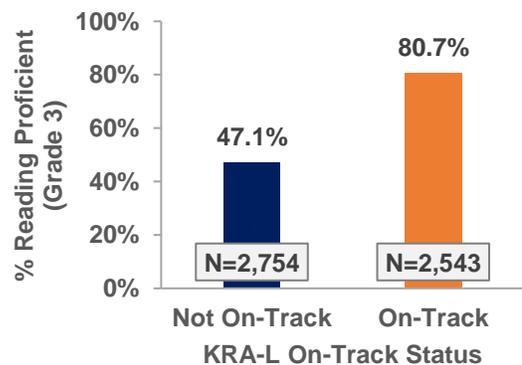


Figure 3. 3rd Grade Math Proficiency by KRA-L Performance Bands

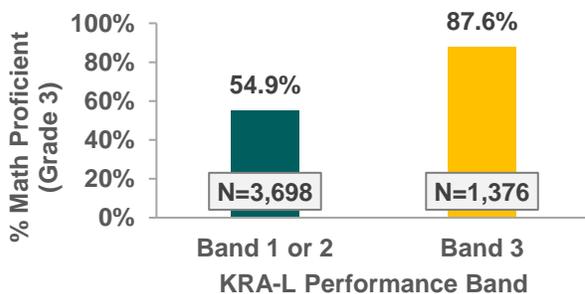
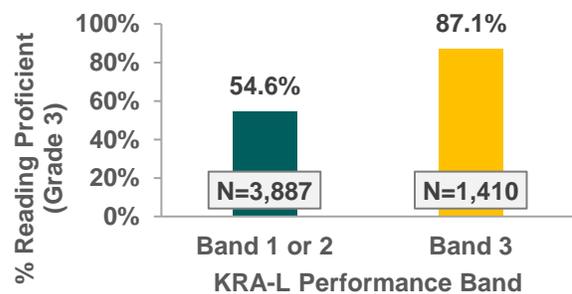


Figure 4. 3rd Grade Reading Proficiency by KRA-L Performance Bands



Kindergarten readiness had a differential impact on students based on their family income and race. Low income children who were ready for kindergarten were **224% more likely** to score proficient on the 3rd grade Math OAT compared to low income children who were not ready for

kindergarten, so that 73.0% of low-income children who were ready for kindergarten were also proficient on the 3rd grade Math OAT (Figure 5). African-American/Black children who were ready for kindergarten were **223% more likely** to score proficient on the 3rd grade Math OAT compared to low income children who were not ready for kindergarten, so that 72.2% of African-American/Black children who were ready for kindergarten were also proficient on the 3rd grade Math OAT. And, White students who were ready for kindergarten were **525% more likely** to score proficient on the 3rd grade Math OAT compared to White children who were not ready for kindergarten, so that 92.0% of White students who were ready for kindergarten were also proficient on the 3rd grade Math OAT (Figure 6).

Figure 5. 3rd Grade Math Proficiency by KRA-L On-Track Status - Low Income Students

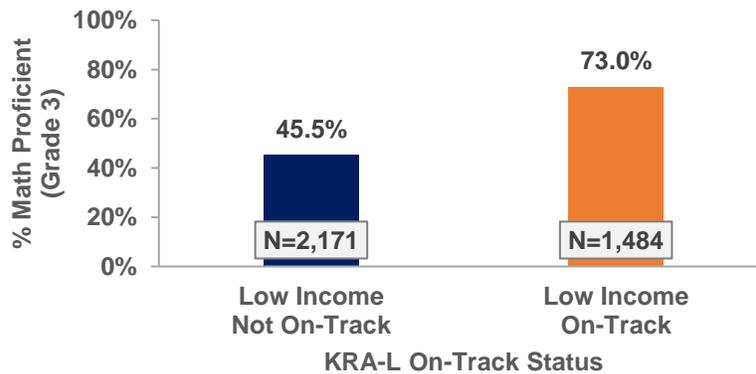
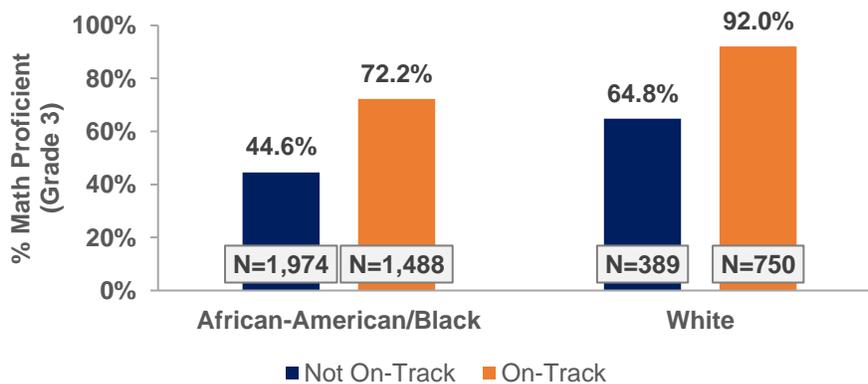


Figure 6. 3rd Grade Math Proficiency by KRA-L On-Track Status - Black and White Students



Low income children who were ready for kindergarten were **270% more likely** to score proficient on the 3rd grade Reading OAT compared to low income children who were not ready for kindergarten, so that 73.4% of low-income children who were ready for kindergarten were also proficient on the 3rd grade Reading OAT (Figure 7). African-American/Black children who were ready for kindergarten were **265% more likely** to score proficient on the 3rd grade Reading OAT compared to low income children who were not ready for kindergarten, so that 74.3% of African-American/Black children who were ready for kindergarten were also proficient on the 3rd grade Reading OAT. And, White students who were ready for kindergarten were **747% more likely** to score proficient on the 3rd grade Reading OAT compared to White children who were not ready for kindergarten, so that 91.7% of White students who were ready for kindergarten were also proficient on the 3rd grade Reading OAT (Figure 8).

Figure 7. 3rd Grade Reading Proficiency by KRA-L On-Track Status - Low Income Students

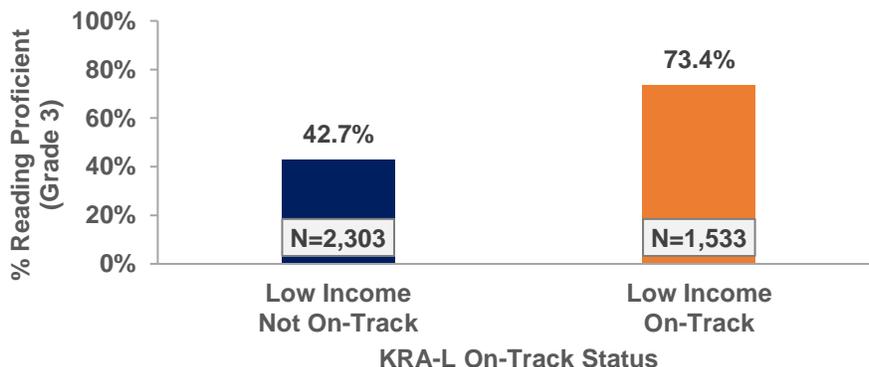
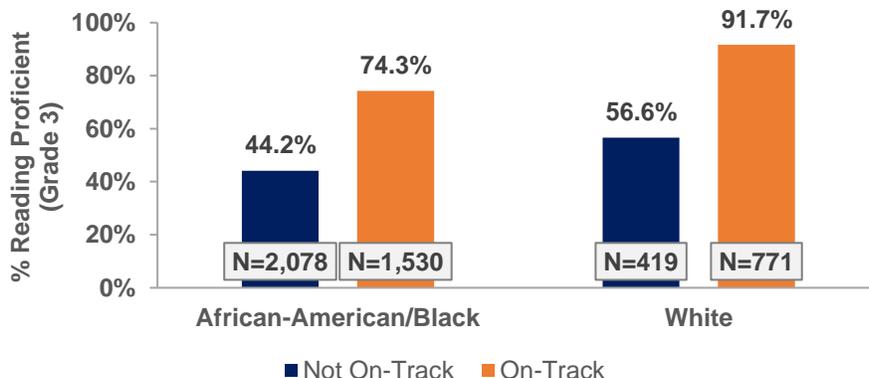


Figure 8. 3rd Grade Reading Proficiency by KRA-L On-Track Status - Black and White Students



Kindergarten Readiness and 8th Grade Achievement

Kindergarten readiness was used to predict 8th grade academic achievement. Students who were “on-track” on the KRA-L were **228% more likely** to score proficient on the 8th grade Math OAT compared to students who were not “on-track”. Students who were “on-track” on the KRA-L were **276% more likely** to score proficient on the 8th grade Reading OAT compared to students who were not “on-track”. So that over 75% of students who were ready for kindergarten were proficient on the 8th grade Math OAT (Figure 9) and over 85% of those who were ready for kindergarten were proficient on the 8th grade Reading OAT (Figure 10).

Figure 9. 8th Grade Math Proficiency by KRA-L On-Track Status

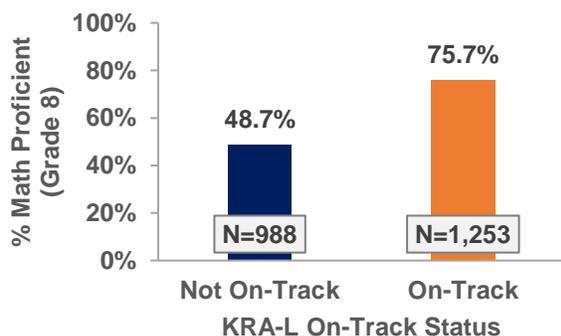
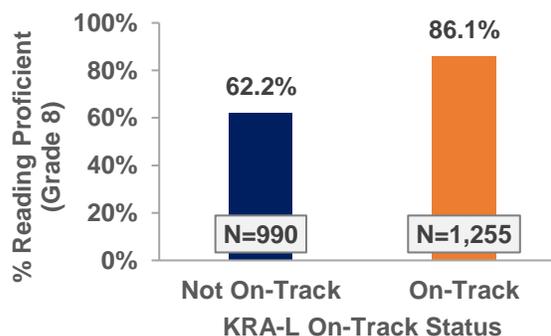


Figure 10. 8th Grade Reading Proficiency by KRA-L On-Track Status



These relationships were stronger when comparing 8th grade reading proficiency and 8th grade math proficiency for children who placed in KRA-L Band 3 (highest achievers). Students whose KRA-L score placed them in Band 3 were **258% more likely** to score proficient on the 3rd grade Math OAT compared to students whose score placed them in Bands 1 or 2. Students whose KRA-L score placed them in Band 3 were **469% more likely** to score proficient on the 8th grade Reading OAT compared to students whose score placed them in Bands 1 or 2. So that over 80% of students who were in Band 3 were proficient on the 8th grade Math OAT (Figure 11) and over 90% of those Band 3 performers were proficient on the 8th grade Reading OAT (Figure 12).

Figure 11. 8th Grade Math Proficiency by KRA-L Performance Bands

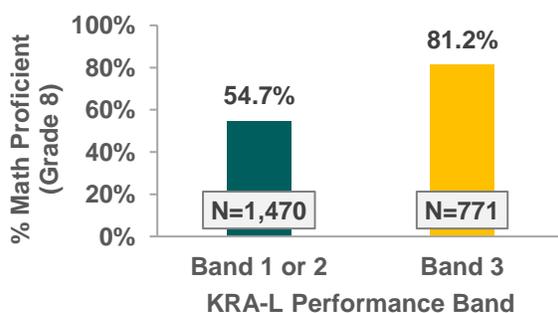
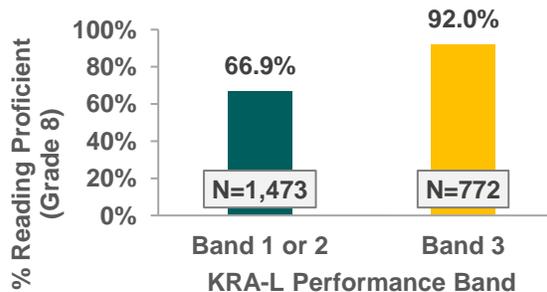


Figure 12. 8th Grade Reading Proficiency by KRA-L Performance Bands



Kindergarten readiness had a differential impact on students based on their family income and race. Low income children who were ready for kindergarten were **137% more likely** to score proficient on the 8th grade Math OAT compared to low income children who were not ready for kindergarten, so that 65.1% of low-income children who were ready for kindergarten were also proficient on the 8th grade Math OAT. (Figure 13). African-American/Black children who were ready for kindergarten were **156% more likely** to score proficient on the 8th grade Math OAT compared to low income children who were not ready for kindergarten, so that 67.3% of African-American/Black children who were ready for kindergarten were also proficient on the 8th grade Math OAT. And, White students who were ready for kindergarten were **556% more likely** to score proficient on the 8th grade Math OAT compared to White children who were not ready for kindergarten, so that 92.1% of White students who were ready for kindergarten were also proficient on the 8th grade Math OAT (Figure 14).

Figure 13. 8th Grade Math Proficiency by KRA-L On-Track Status - Low Income Students

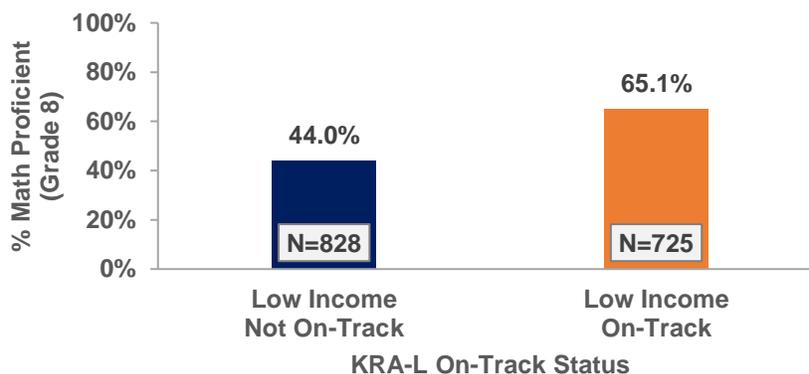
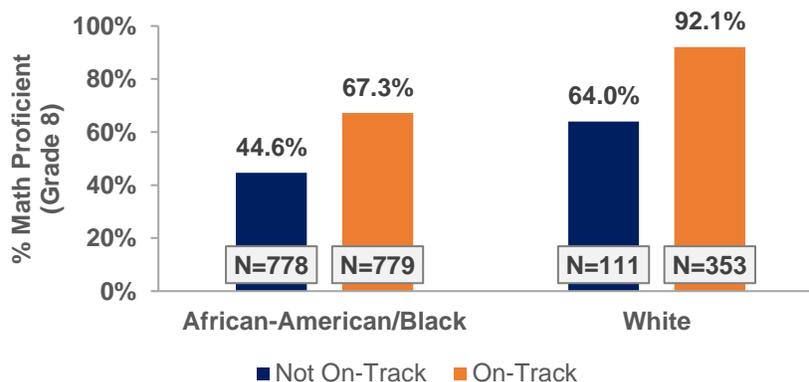


Figure 14. 8th Grade Math Proficiency by KRA-L On-Track Status - Black and White Students



Low income children who were ready for kindergarten were **175% more likely** to score proficient on the 8th grade Reading OAT compared to low income children who were not ready for kindergarten, so that 79.7% of low-income children who were ready for kindergarten were also proficient on the 8th grade Reading OAT (Figure 15). African-American/Black children who were ready for kindergarten were **192% more likely** to score proficient on the 8th grade Reading OAT compared to low income children who were not ready for kindergarten, so that 80.8% of African-American/Black children who were ready for kindergarten were also proficient on the 8th grade Reading OAT. And, White students who were ready for kindergarten were **951% more likely** to score proficient on the 8th grade Reading OAT compared to White children who were not ready for kindergarten, so that 96.6% of White students who were ready for kindergarten were also proficient on the 8th grade Reading OAT (Figure 16).

Figure 15. 8th Grade Reading Proficiency by KRA-L On-Track Status - Low Income Students

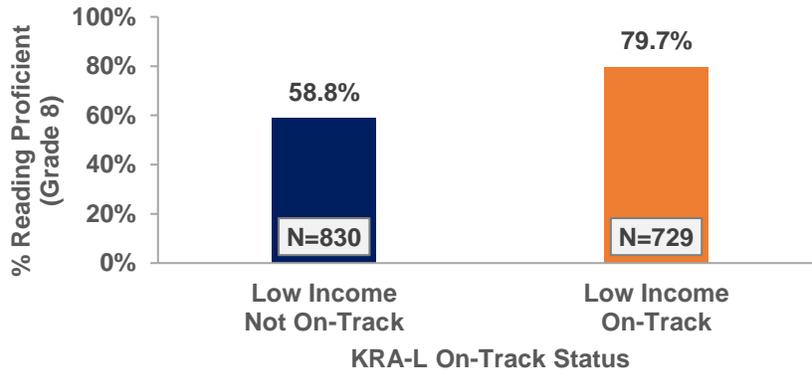
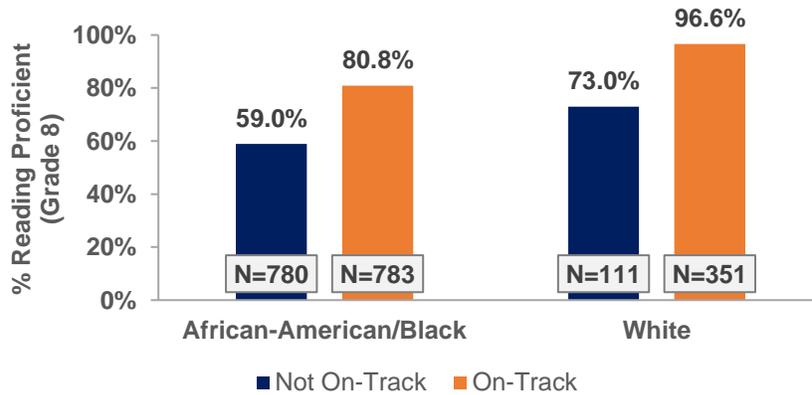


Figure 16. 8th Grade Reading Proficiency by KRA-L On-Track Status - Black and White Students



Note About Race/Ethnicity Trends: Students who were ready for kindergarten performed better at each academic milestone, regardless of race or income status. Therefore, the race and income-related focus of the rest of this report will be on African/American and low-income students as these are demographics of special interest.

Kindergarten Readiness and 11th and 12th Grade ACT Scores

Kindergarten readiness was positively associated with higher ACT composite scores for the test taken in either 11th grade or 12th grade. Students who were “on-track” for kindergarten readiness scored on average **5.08 points higher** for 11th graders and **4.3 points higher** for 12th graders compared to students who were not on-track (Figure 17). These relationships were stronger when comparing ACT composite scores between students in Band 3 and Bands 1 and 2. Students who placed in KRA-L Band 3 scored on average **5.5 and 4.6 points higher** on the 11th grade and 12th grade ACT, respectively compared to students in Bands 1 and 2 (Figure 18).

Figure 18. Average 11th and 12th Grade ACT Composite Scores by KRA-L Performance Bands

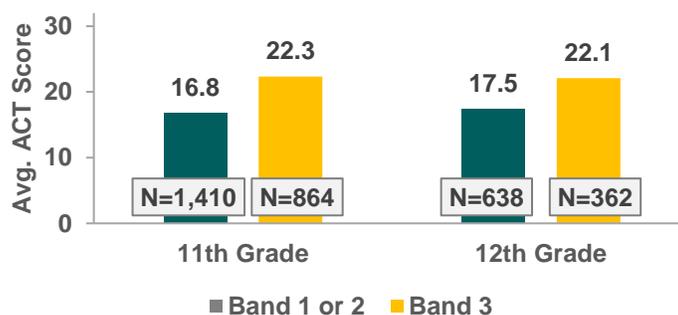
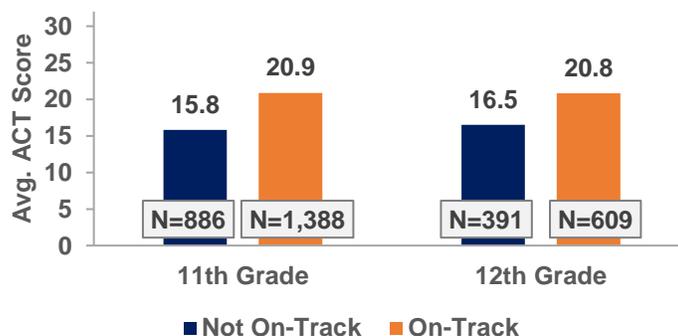


Figure 17. Average 11th and 12th Grade ACT Composite Scores by KRA-L On-Track Status



Kindergarten readiness had a differential impact on the ACT score of low income and African-American/Black students. Low income students who were “on-track” for kindergarten readiness scored on average **2.6 points higher** for both 11th graders and 12th graders compared to students who were not on-track (Figure 19). African-American/Black students who were “on-track” for kindergarten readiness scored on average **2.7 points higher** for 11th graders and **2.6 points higher** for 12th graders compared to students who were not “on-track” (Figure 20).

Figure 19. Average 11th and 12th Grade ACT Composite Scores by KRA-L On-Track Status Among Low Income Students

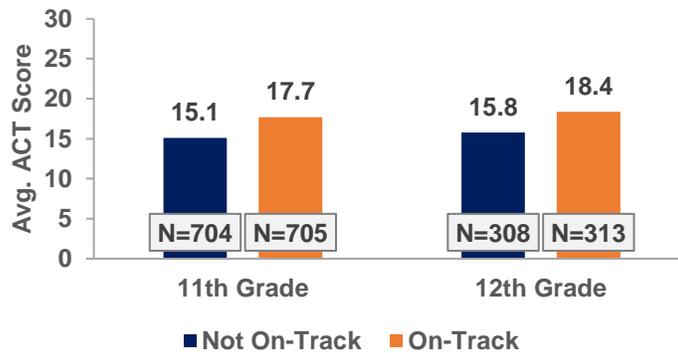
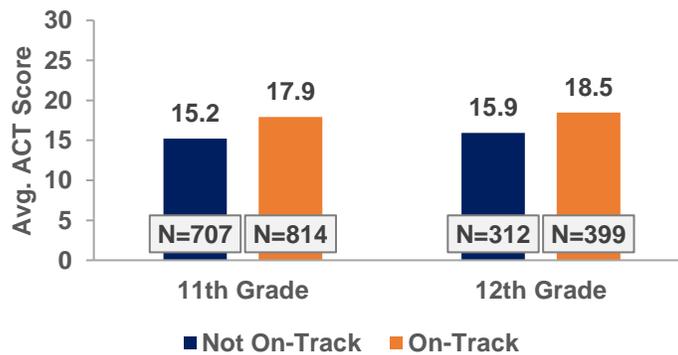


Figure 20. Average 11th and 12th Grade ACT Composite Scores by KRA-L On-Track Status - African-American/Black Students



Kindergarten Readiness and High School Credits Earned

Kindergarten readiness was positively associated with the number of high school credits earned by end of 12th grade. Figure 21 shows that students who were on “on-track” for kindergarten readiness completed, on average, **1.6 more credits** by the end of 12th grade than those who were not ready. Credits completed equate to approximately 3 additional classes (each class is 0.5 credits). Twenty-four credits are needed to graduate. Figure 22 shows that students who were ready for kindergarten completed on average **1.8 more credits** by the end of 12th grade than those who were not ready. This equates to a little more than 3 additional classes (each class is 0.5 credits). Twenty-four credits are needed to graduate.

Figure 21. Average 12th Grade Credits Earned by KRA-L On-Track Status

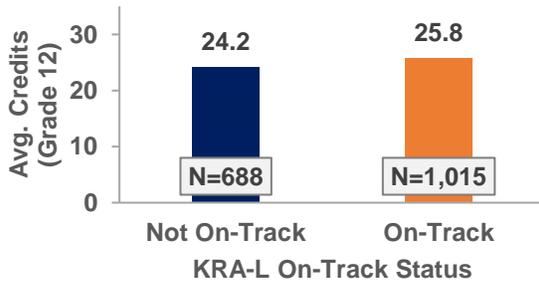
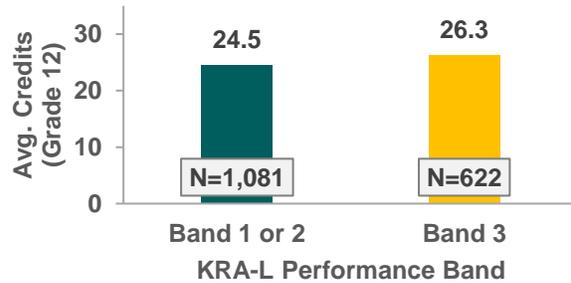


Figure 22. Average 12th Grade Credits Earned by KRA-L Performance Bands



Kindergarten readiness had a differential impact on the number of credits earned for low income and African-American/Black children. Figure 23 shows that low income students who were on “on-track” for kindergarten readiness completed, on average, **1 more credits** by the end of 12th grade than those who were not ready. Credits completed equate to approximately 2 additional classes. Figure 24 shows that African-American/Black students who were ready for kindergarten completed on average **1.1 more credits** by the end of 12th grade than those who were not ready. This equates to a little more than 2 additional classes.

Figure 23. Average 12th Grade Credits Earned by KRA-L On-Track Status - Low Income Students

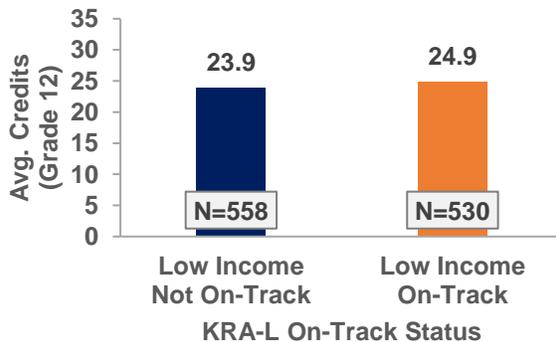
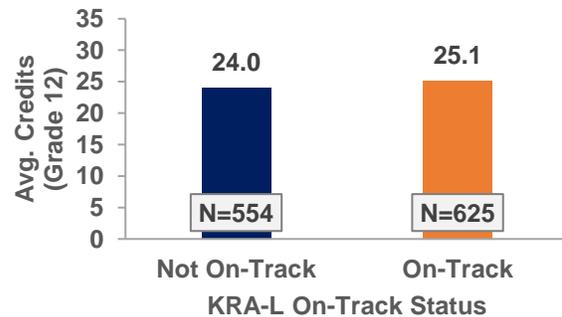
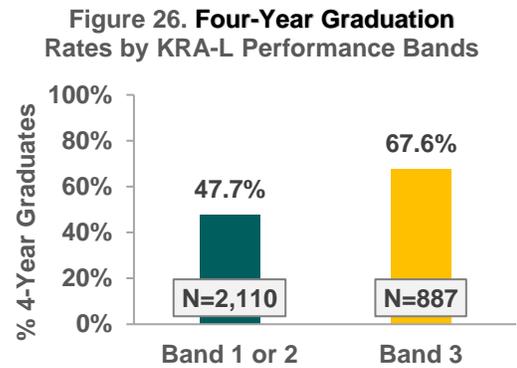
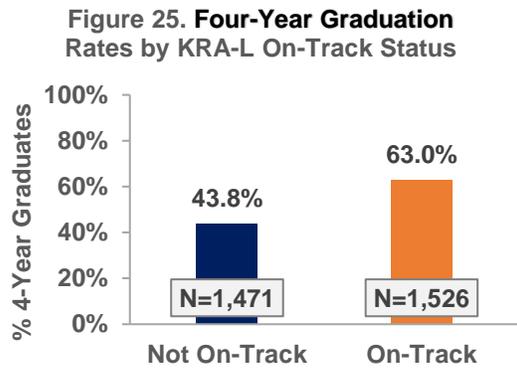


Figure 24. Average 12th Grade Credits Earned by KRA-L On-Track Status - African-American/Black Students

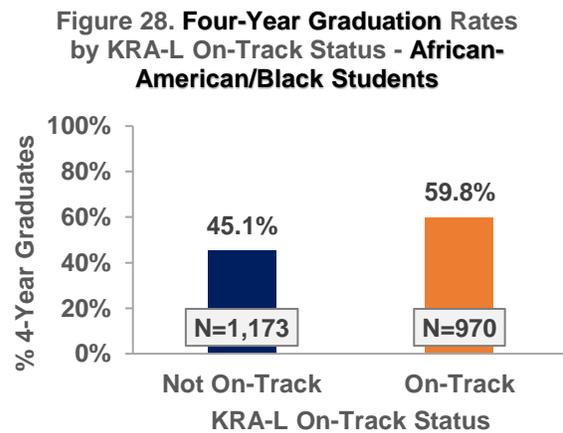
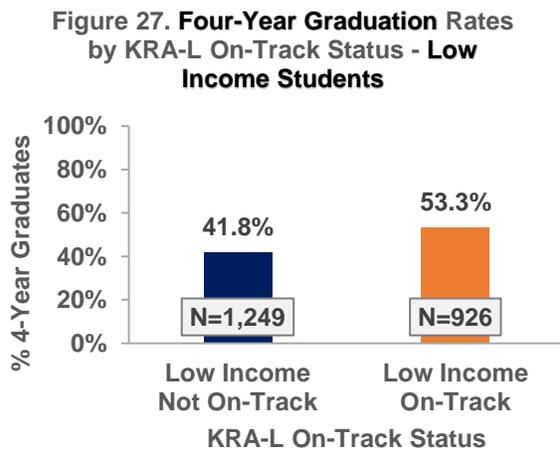


Kindergarten Readiness and Four-Year Graduation Status

Kindergarten readiness was predictive of four-year high school graduation. A logistic model was estimated in which kindergarten readiness was used to predict four-year high school graduation. Of students who were on-track for kindergarten, 63.0% graduated within four years of entering 9th grade compared to 43.8% of students who were not on-track (Figure 25). Students who were ready for kindergarten were **118% more likely** to graduate on time compared to students who were not ready. Of students who were in Band 3, 67.6% graduated within four years of entering 9th grade compared to 47.7% of students who were in Bands 1 and 2 (Figure 26). Students who were in Band 3 were **129% more likely** to graduate on time compared to students in Bands 1 and 2.



Kindergarten readiness had a differential impact on whether low income and African-American/Black students graduated on time. Low income children who were ready for kindergarten were **59% more likely** to graduate on time compared to low income children who were not ready for kindergarten, so that 53.3% of low-income children who were ready for kindergarten were also graduated on time (Figure 27). African-American/Black children who were ready for kindergarten were **81% more likely** to graduate on time compared to African-American/Black children who were not ready for kindergarten, so that 59.8% of African-American/Black children who were ready for kindergarten also graduated on time (Figure 28).



Key Findings: Kindergarten Through 12th Grade Outcomes

- 1. Kindergarten Readiness Impacts 3rd and 8th Grade Achievement:** Students who were on-track for kindergarten readiness/literacy (score of 19 or higher) and those who were in Band 3 (score of 24 or higher) performed significantly better on 3rd and 8th grade reading and math. For students who were on-track in kindergarten, 33.6% more students were proficient in reading compared to students who were not on-track in kindergarten (23.9% difference for 8th grade reading proficiency). For students who were on-track in kindergarten, 31% more students were proficient in math compared to students who were not on-track in kindergarten (27% difference for 8th grade math proficiency).
- 2. Kindergarten Readiness is Related to Long-Term Achievement:** There were long-term achievement outcomes such as higher ACT scores, more credits earned, and greater likelihood of high school graduation associated with being on-track for kindergarten readiness (score of 19 or higher) compared to not being on-track for kindergarten readiness (Score of 18 or lower). Increased graduation, employment and college enrollment also results in community and economic benefits for students and society.
- 3. For Low Income Students, Kindergarten Readiness Matters Most:** Kindergarten readiness reduced academic risks, especially for low income students. Of students who were on-track for kindergarten, 30% more students were reading proficient compared to students who were not on-track for kindergarten (23.9% difference for 8th grade reading proficiency). Similar trends were noted for math proficiency.
- 4. Pursue Opportunities to Address Gaps in Readiness and Achievement:** Note that many students entered school ready to learn and succeed, while other students needed supports to adapt, learn and/or achieve. While some students were not on-track in kindergarten, they were all valued, and many of them made gains, succeeded, and graduated.
- 5. Ensure Support and Success of All Students:** Future efforts will need to examine best practices to ensure the support, achievement, and success of all students regardless of income, race, or background. This will include ensuring that students who may not be prepared for kindergarten will graduate ready to succeed in life.

Part B. Preschool Attendance: Kindergarten Readiness and Academic Outcomes

Methods

Sample

De-identified data including kindergarten readiness and preschool attendance were provided for analysis. The sample was comprised of students who attended CPS kindergarten in the 2004-2005, 2005-2006, and 2006-2007 academic years. These cohorts were combined to increase the sample size and power for analyses. The original combined cohort was comprised of 8,208 students. Of this cohort, 1,831 attended a CPS preschool prior to kindergarten and 6,377 did not. In Table 2, demographics are illustrated by CPS preschool attendance and include gender, ethnicity, and low-income status (at 200% of poverty or below). Demographics by CPS preschool attendance are also shown for members of the original cohort at 3rd grade (Table 3). Both tables indicate a larger proportion of CPS preschool attendees being African-American/Black and low income than those who did not attend a CPS preschool. The demographics (income, mobility, etc.) presented in this evaluation (in the tables below) are similar to other published national studies on city preschool and school evaluation initiatives (Kenne et al., 2018; Fischbein et al., 2016; Kurdek & Sinclair, 2001).

Demographics at Kindergarten	Did Not Attend CPS Preschool (77.7%)	Attended CPS Preschool (22.3%)
Male	50.8%	50.0%
Female	48.6%	49.8%
Unknown Gender	0.5%	0.2%
African-American/Black	63.3%	70.0%
White	24.9%	20.8%
Multi-Racial	5.4%	5.2%
Hispanic	2.7%	1.5%
Other	1.2%	1.4%
Unknown Race	2.5%	1.1%
Low Income	71.0%	77.3%
Other Income	27.6%	21.6%
Unknown Income	1.4%	1.1%
Not On-Track in Literacy	55.8%	45.2%
On-Track in Literacy	44.2%	54.8%
Sample Size at Kindergarten	6377	1831

Table 3. Student Demographic Profiles for 3rd Graders who Attended CPS Preschool Programs		
Demographics at Grade 3	Did Not Attend CPS Preschool (76.8%)	Attended CPS Preschool (23.2%)
Male	50.6%	49.6%
Female	49.0%	50.4%
Unknown Gender	0.4%	0.0%
African-American/Black	67.2%	71.1%
White	22.9%	20.9%
Multi-Racial	5.3%	4.6%
Hispanic	2.5%	1.5%
Other	0.9%	1.4%
Unknown Race	1.1%	0.5%
Low Income	71.6%	77.1%
Other Income	27.2%	21.9%
Unknown Income	1.2%	1.0%
Not On-Track in Literacy	55.5%	44.9%
On-Track in Literacy	44.5%	55.1%
Sample Size at Grade 3	4223	1278

Measures

Kindergarten Readiness

During Academic Years 2004-05, 2005-06, and 2006-07, CPS administered the Kindergarten Readiness Assessment – Literacy (KRA-L) Test, the state screener for assessing literacy skills and academic readiness in kindergarten children. The KRA-L is a 25-item assessment on which children can achieve a maximum of 29 points. The KRA-L domains are as follows: Answering Questions - Number Correct (Items 1-3), Sentence Repetition - Number Correct (Items 4-7), Rhyming and Identification - Number Correct (Items 8-14), Rhyming Production - Number Correct (Items 15-19), Letter Identification - Number Correct (Items 20-21), and Initial Sounds - Percent Correct (Items 22-25).

The KRA-L can be grouped by a cut-off score of 19 points or higher as being “on-track.” This cut-off score was established based on state-level mean scores on the KRA-L from the 2005-06 year and literature citing expected competencies on literacy and school readiness measures (Ohio Department of Education, 2005; Kurdek & Sinclair, 2001). For this evaluation, students who were “on-track” are considered ready for kindergarten. The KRA-L can also be divided into achievement bands. For this evaluation, students scoring in Band 3 (Assess for enriched instruction; 24-29 points) were compared to students and students scoring in Band 1 (Assess broadly for intense instruction; 0-13 points) and Band 2 (Assess for targeted instruction; 14-23 points).

Preschool Attendance

Preschool attendance was measured by number of years enrolled as well as days that each student was absent while enrolled in each academic year. If a student enrolled in multiple years of CPS preschool, attendance was calculated for their most recent year of attendance prior to kindergarten. Students were considered chronically absent if they missed 18 or more days during an academic year. Students were considered to have attended regularly if they missed less than 18 days during an academic year. Data included in the “Did Not attend” CPS preschool category come from students with no documented CPS preschool or Head Start attendance but may include undocumented preschool attendance, home schooling, and no preschool attendance.

Income

Free/Reduced lunch status was used as a proxy for income. Students who were eligible for free/reduced lunch are included in the “low income” group and students who paid for their lunch were included in the “other income” group.

Third Grade Reading and Math Achievement

Cincinnati Public Schools (CPS) administered the Ohio Achievement Test (OAT) to assess children enrolled in 3rd grade from 2004-05 to 2012-13. Students were given Ohio proficiency-based assessments in reading and mathematics. Each assessment involved both multiple-choice and open-ended items. Five designations have been adopted for each child's performance by the state of Ohio for the Grade 3 Math and Reading Achievement Tests. The levels for scaled scores are (a) Advanced 432 and above, (b) Accelerated 415-431, (c) Proficient 400-414, (d) Basic 385-399, and (e) Limited 0-384 (Ohio Department of Education, 2005). For this evaluation, students whose scaled scores placed them in the proficient, accelerated, or advanced categories are considered “proficient” and those students whose scaled scores placed them in basic or limited categories are considered “not proficient.” If a student had multiple test scores, the highest score was selected for analysis.

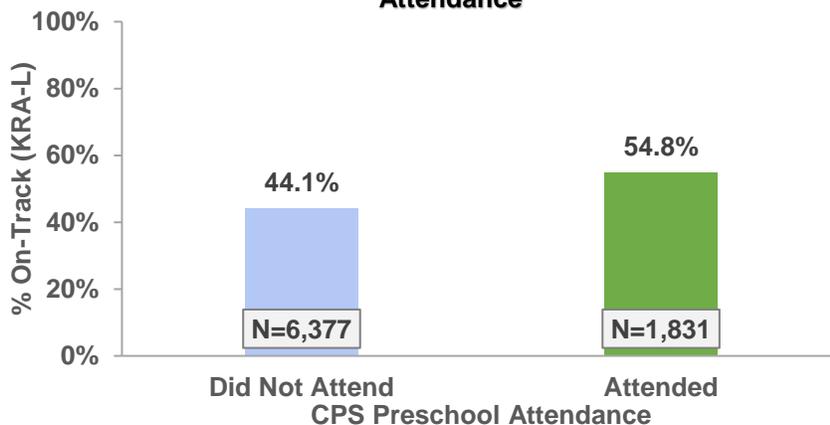
Data Analyses

The data for this project came from the 2004-2005, 2005-2006, and 2006-2007 graduating classes of students who took the Kindergarten Readiness Assessment-Literacy (KRA-L). These groups were combined to allow for a more comprehensive analysis and for more power in the analyses. Descriptive and inferential analyses were performed. Data were analyzed using logistic regression producing odds ratios and 95% confidence intervals or *t*-tests. All Odds Ratios have been converted to risk ratios for ease and accuracy of interpretation. All reported outcomes are statistically significant at an alpha level greater than 0.05. Outcomes are presented comparing students who were “on-track” (19-29 points) to students who were “not on-track” (0-18 points) as well as comparing students scoring in Band 3 (Assess for enriched instruction; 24-29 points) to students scoring in Band 1 (Assess broadly for intense instruction; 0-13 points) and Band 2 (Assess for targeted instruction; 14-23 points).

Preschool Attendance and Kindergarten Achievement

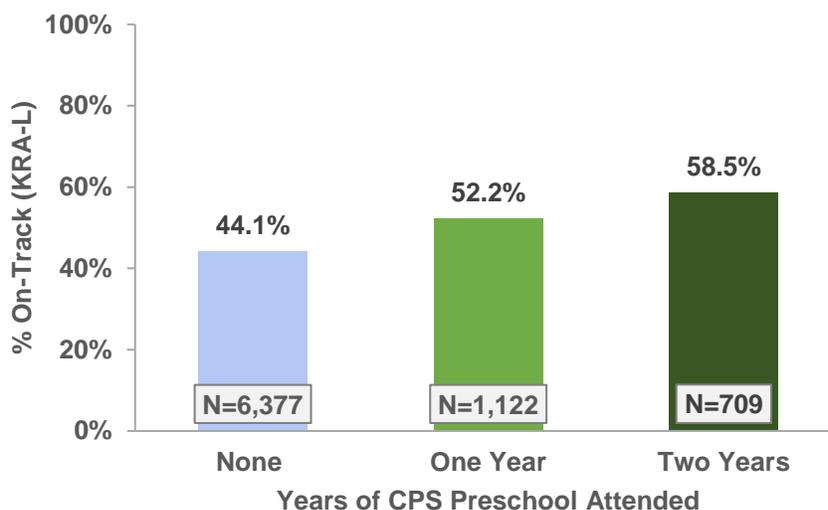
CPS preschool attendance was predictive of kindergarten readiness. Of students who attended a CPS preschool, 54.8% were on-track compared to 44.1% of students who did not attend a CPS preschool. Students who attended preschool were **53% more likely** to score “on-track” on the Kindergarten Readiness Assessment – Literacy (KRA-L) compared to students who did not attend preschool (Figure 29).

Figure 29. Percent On-Track by CPS **Preschool Attendance**



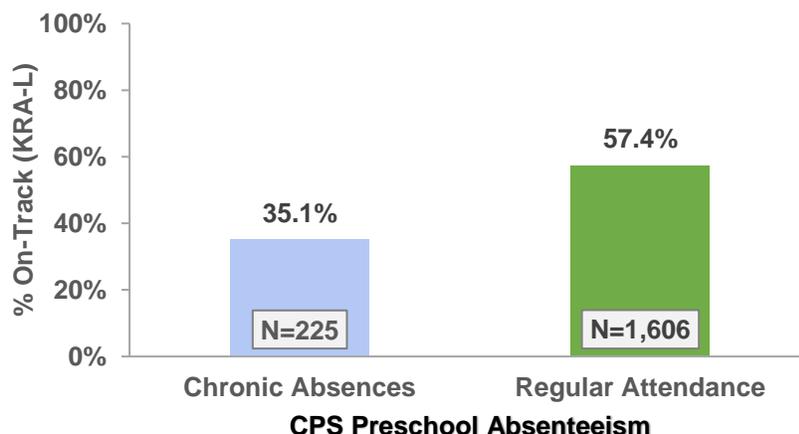
Dosage had an impact on KRA-L performance both in the years of CPS preschool enrollment and in the number of absences. Figure 30 shows that students with two years of CPS preschool (58.5%) performed better on the KRA-L than those with 1 year (52.2%) and those with no CPS preschool (44.1%). Students with 2 years of preschool attendance were **79% more likely** to score “on-track” on the KRA-L compared to students without preschool attendance. Students with 2 years of preschool attendance were **29% more likely** to score “on-track” on the KRA-L compared to students with only 1 year of preschool attendance.

Figure 30. Percent On-Track by CPS **Preschool Dosage**



Preschool attendance also had an impact on kindergarten readiness with only 35.1% of chronically absent students (less than 90% attendance) on-track compared to 57.4% of students who regularly attended a CPS preschool prior to kindergarten (Figure 31). Children who attended preschool regularly (90% or more days) were **149% more likely** to be ready for kindergarten compared to children who were chronically absent.

Figure 31. Percent On-Track by CPS Preschool Attendance



Income and demographic factors were assessed to determine their impact on KRA-L performance. Relationships can be seen within race, and family income (i.e., low income status). Figure 32 shows that students with low income status were much less frequently on-track (38.9%) compared to those with paid lunch status (67.6%). Regarding differences in performance by race, Hispanics (23.5%) and African-Americans scored on-track less frequently compared to white (60.7%), multi-racial (56.2%), and other (62.1%) races (Figure 33).

Figure 32. Percent On-Track by Income

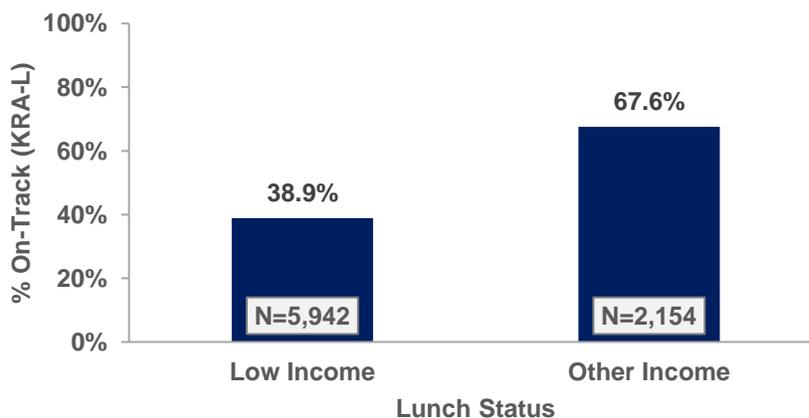
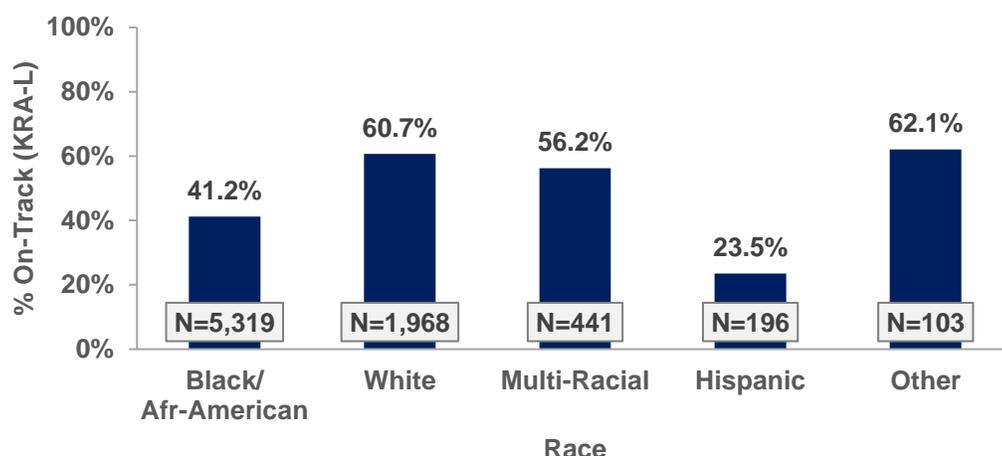


Figure 33. Percent On-Track by Race



CPS preschool attendance had a differential impact on low income and African-American/Black children. Low income children who attended preschool were **74% more likely** to score “on-track” on the KRA-L compared to low income children who did not attend preschool so that almost half of low-income children who attended preschool were also ready for kindergarten (Figure 34). African-American/Black children who attended preschool were **66% more likely** to score “on-track” on the KRA-L compared to black children who did not attend preschool, so that over 50% of black children who attended preschool were ready for kindergarten (Figure 35).

Figure 34. Low Income Students: Percent On-Track by CPS Preschool Attendance

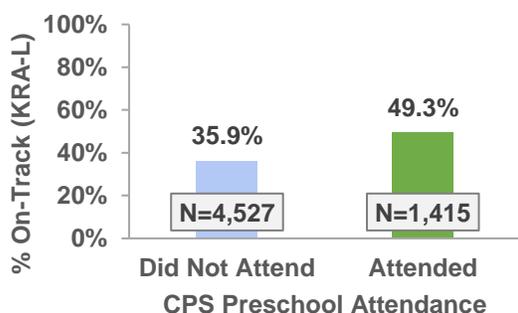
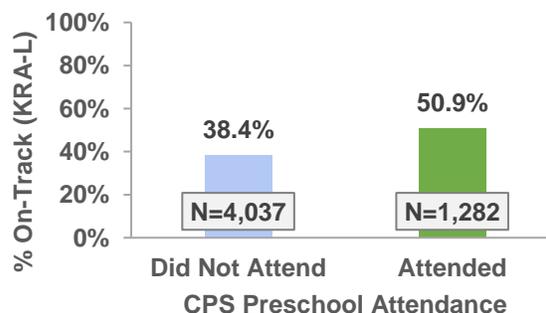
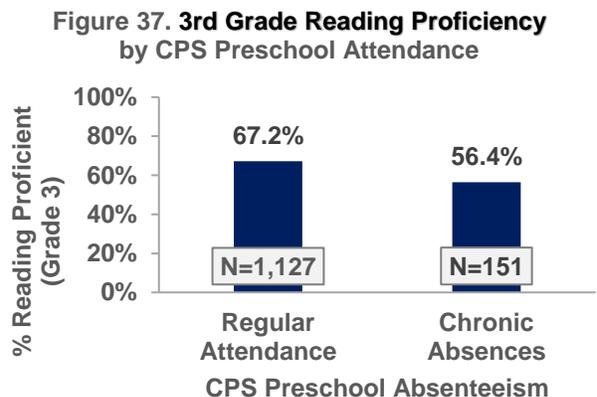
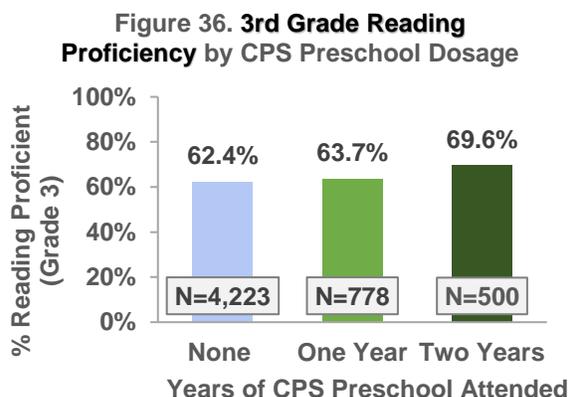


Figure 35. African-American/Black Students: Percent On-Track by CPS Preschool Attendance



Preschool Attendance and 3rd Grade Achievement

Preschool attendance positively related to 3rd grade academic achievement. CPS preschool dosage was a significant factor as 69.6% of 3rd graders who attended preschool for 2 years were proficient on the 3rd grade Reading Ohio Achievement Test (OAT) compared to only 62.4% of those who did not attend preschool (Figure 36). Also, students who attended preschool on a regular basis were **58% more likely** to score proficient on the 3rd grade Reading OAT compared to students who were chronically absent (Figure 37).



Key Findings: Preschool Attendance and Academic Outcomes

1. **Preschool Attendance Supports Kindergarten Readiness:** Preschool attendance significantly increases children's kindergarten readiness on the KRA-L. Children who attended preschool were 53% more likely to be measured as on-track for kindergarten on the KRA-L (54.8% on-track) compared to those who did not attend preschool (44.2% on-track).
2. **Daily Attendance is Important to Learning and Kindergarten Readiness:** Preschool attendance is critical to improving kindergarten readiness. Children who attend more days (>90% of days) during a school year were significantly more ready for kindergarten (KRA-L). Those with regular attendance were 149% more likely to be on-track for kindergarten (57.4% ready) compared to 35.1% ready for those with chronic absenteeism (<90% attendance).
3. **More Years of Preschool Benefits Children:** Children with more years of preschool are more ready for kindergarten (KRA-L). Only 44.1% of children were on-track for readiness in kindergarten with no preschool, whereas 58.5% of children with two (2) years of preschool were on-track for kindergarten, and 52.2% of children with one (1) year of preschool were on-track for kindergarten.
4. **Low Income and African/Black Students Especially Benefit from Preschool:** Low income students who attended preschool were 74% more likely to score on-track on the KRA-L compared to their peers who did not attend preschool. African-American students who attended preschool were 66% more likely to score on-track on the KRA-L compared to their peers who did not attend preschool.
5. **Preschool Benefits Children Through 3rd Grade:** The benefits of preschool were sustained through 3rd grade, with children who attended two years of preschool showing higher 3rd grade reading achievement scores compared to children who did not attend preschool. Children who attended preschool regularly (>90% attendance) showed higher 3rd grade reading scores compared to those who did not attend regularly (<90% attendance).

6. **Expand Knowledge and Understanding Through Evaluation and Research:** Due to attrition, the small sample of preschool children, and other limitations, analyses could not be run reliably to test effects beyond 3rd grade. Future evaluation and research that include additional student, family, and academic variables will provide an enhanced understanding of the link between preschool attendance, kindergarten readiness and long-term academic success.

Overall Learnings and Opportunities

1. *Enrollment and Regular Attendance in a High Quality Preschool Matters*
 - An important step to ensuring that children are ready for kindergarten is to enroll them in a high quality preschool.
 - Low income children especially benefit from preschool as they are more likely to show the benefits of preschool compared to their peers who did not go to preschool especially through 3rd grade.
 - Children who attend 2 years of preschool (vs one year or not at all) are more likely to be ready for kindergarten.
 - Children who attend preschool regularly have increased kindergarten readiness compared to those who are chronically absent.
2. *Readiness for Kindergarten is Fundamental for Academic Success*
 - Students who attended preschool were more ready for kindergarten.
 - Kindergarten readiness is linked to a number of academic outcomes including better performance on 3rd and 8th grade State Math and Reading tests, higher ACT scores, more high school credits earned, and four-year graduation.
 - Low income and African-American/Black students especially benefit from being ready for kindergarten.
 - Individualized assessment and instruction may be key to ensuring that students' needs are identified early and that students make progress academically and socially.
3. *Supporting Every Student is Important to Closing Performance Gaps*
 - Performance gaps exist for some students. Educational support and opportunities can provide enrichment opportunities and resources for students and families when needed.
 - Providing students with learning supports in the classroom and during out-of-school time have been shown to benefit children.
 - Teachers and parents play an important role in identifying areas of strengths and opportunities for students and providing them with consistent encouragement.
 - Data-driven strategies are important to implementing best practices and applying these approaches to real world classroom settings.
 - Planning among teachers, staff and leadership can ensure that supporting every student from preschool through high school graduation continues to be a priority.

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Report Prepared By
INNOVATIONS in Community Research and Program Evaluation
Cincinnati Children's Hospital Medical Center
3333 Burnet Avenue, MLC 8700, Cincinnati, OH 45229
innovations@cchmc.org

